INTERNSHIP REPORT 2015

LUCKY CEMENT LIMITED, KARACHI

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DEPARTMENT OF ELECTRICAL ENGINEERING

PREFACE

This report has been given by the authors to convey the information about different departments of lucky cement limited, which has been visited during our internship. We have discussed the different specifications, processing and production of the department we visited. We have tried to give some history of the processes, survey and importance of the processing as well.

ACKNOWLEDGEMENT

First of all we would like to thanks Al-mighty Allah, The Most Beneficent and Merciful. We are very happy to avail this golden opportunity of getting training at lucky cement plant. We are thankful to General Manager of Lucky cement plant at Karachi Mr. Mashkoor Ahmed who provided us such a valuable opportunity.

A lot of thanks to an Electrical Manager " ALI RAZA SAMOON" who provided us assistance in such a friendly environment.

We are also thankful for providing us information about the plants. This report is a result of handwork of not a single person but many persons have aided by volunteering their services to create this text. Their kindness thus improving this report with their Additional technical knowledge has contributed mightly to the quality of this work. We got much practical knowledge which was not possible to gain in the university during studies.

Overall, we are thankful to all the Officers & the workers of Lucky cement Ltd.

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UNIT NO.1

INTRODUCTION

INTRODUCTION TO CEMENT

Cement is the nonmetallic bonding material used for construction

Or

Cement is binding material which is used in construction.

HISTORY OF CEMENT

History of cement is very old as human civilization. Romans used volcanic tuff mixed raw material for their construction .Egyptians used it for the construction of PYRAMIDES.

In 1824 English man Joseph Aspdin, patented artificial cement made by the calcinations of an argillaceous lime stone. He Cal edit "Portland" because concrete made from it resembles with a famous building stone obtained from land near England.

TYPES OF CEMENT

ASTM C150

There are five types of Portland cements with variations of the first three according to ASTM (AMERICAN SOCITY OF TESTING MATERIAL) C150.

1. COMMON or GENERAL PURPOSE CEMENT

It is generally assumed unless another type is specified. It is commonly used for general construction especially when making precast and precast-pre-stressed concrete that is not to be in contact with soils or ground water. The typical compound compositions of this type are:

55% (C_3S), 19% (C_2S), 10% (C_3A), 7% (C_4AF), 2.8% MgO, 2.9% (SO_3), 1.0% Ignition loss, and 1.0% free CaO.

A limitation on the composition is that the (C_3A) shall not exceed fifteen percent.

2. SULPHATE RESISTANCE CEMENT

Type II is intended to have moderate sulfate resistance with or without moderate heat of hydration. This type of cement costs about the same as Type I. Its typical compound composition is:

51% (C3S), 24% (C2S), 6% (C3A), 11% (C4AF), 2.9% MgO, 2.5% (SO3), 0.8% Ignition loss, and 1.0% free CaO.

A limitation on the composition is that the (C3A) shall not exceed eight percent which reduces its vulnerability to sulfates

3. RAPID HARDENING CEMENT

Type III is has relatively high early strength. Its typical compound composition is:

57% (C3S), 19% (C2S), 10% (C3A), 7% (C4AF), 3.0% MgO, 3.1% (SO3), 0.9% Ignition loss, and 1.3% free CaO.

This cement is similar to Type I, but ground finer. Some manufacturers make a separate clinker with higher C3S and/or C3A content, but this is increasingly rare, and the general purpose clinker is usually used, ground to a specific surface typically 50-80% higher. The gypsum level may also be increased a small amount

4. LOW HEAR OF HYDRATION CEMENT

Type IV Portland cement is generally known for its low heat of hydration. Its typical compound composition is:

28% (C3S), 49% (C2S), 4% (C3A), 12% (C4AF), 1.8% MgO, 1.9% (SO3), 0.9% Ignition loss, and 0.8% free CaO.

The percentages of (C2S) and (C4AF) are relatively high and (C3S) and (C3A) are relatively low. A limitation on this type is that the maximum percentage of (C3A) is seven, and the maximum percentage of (C3S) is thirty-five.

5. SULPHATE RESISTANCE

Type V is used where sulfate resistance is important. Its typical compound composition is:

38% (C3S), 43% (C2S), 4% (C3A), 9% (C4AF), 1.9% MgO, 1.8% (SO3), 0.9% Ignition loss, and 0.8% free CaO.

This cement has a very low (C3A) composition which accounts for its high sulfate resistance. The maximum content of (C3A) allowed is five percent

PRODUCTS OF LUCKY CEMENT

Lucky Cement aims at producing cement to suit every user. The following types of cement are available:

1. Ordinary Portland cement
2. Sulphate Resistant Cement

1. ORDINARY PORTLAND CEMENT (OPC)

Ordinary Portland cement is available in darker shade as well as in light shades in Lucky Star with different brand names to suit the requirement of users.

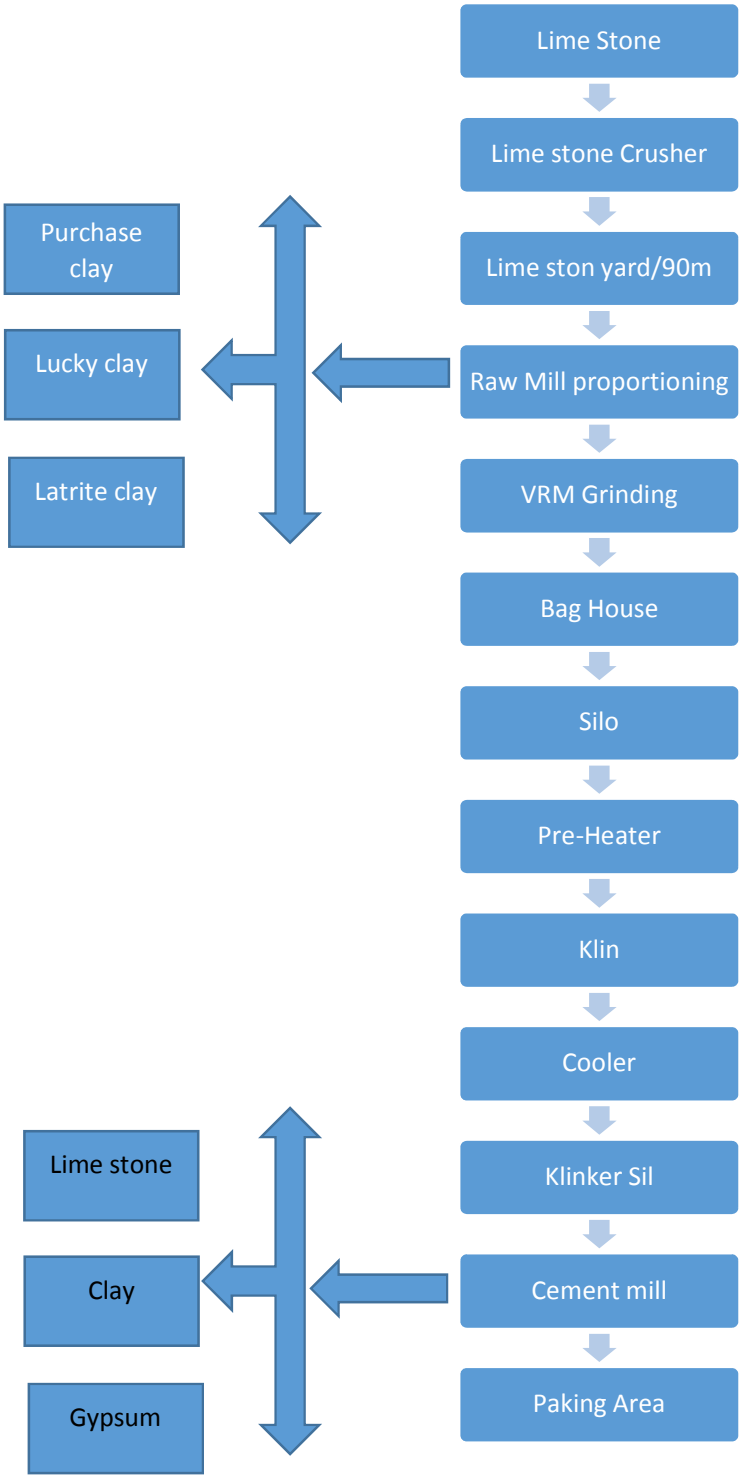
It is used in all general constructions especially in major prestigious projects where cement is to meet stringent quality requirements; it can be used in concrete mortars and grouts etc. Ordinary Portland cement is compatible/consumable with admixture/ retarders etc.

2. SULPHATE RESISTANT CEMENT (SRC)

Sulphate resistant Cement's best quality is to provide effective and long lasting strength against sulphate attacks and is very suitable for constructions near sea shores as well as for canals linings. It provides very effective protection against alkali attacks.

, higher compressive and flexural strengths, and improved resistance to aggressive chemicals.

Overall flow diagram of lucky cement plant.



UNIT NO. 2

LIME STONE CRUSHER

HAMMER CRUSHER

In lucky cement industry hammer crusher are used for crushing the lime stone. The hammer crusher contain 5 rows and 9 hammers in each row it means that hammer crusher has 45 hammers.

A hammer mill is a machine whose purpose is to shred material into fine particles. They have many sorts of applications in many industries, including:

WORKING AND CONDITION

The basic principle is straightforward. A hammer mill is essentially a steel drum containing a vertical or horizontal rotating shaft or drum on which hammers are mounted. The hammers are free to swing on the ends of the cross, or fixed to the central rotor. The rotor is spun at a high speed inside the drum while material is fed into a feed hopper. The material is impacted by the hammer bars and is thereby shredded and expelled through screens in the drum of a selected size.

Hammer mills can be operated on medium voltage motor called (mv) motor. It has power of 1000 kilowatt (1 MW) to the hammer mill.

The Screen less hammer mill uses air flow to separate small particles from larger ones. It is designed to be more reliable, and is also claimed to be much cheaper and more energy efficient than regular hammer mills.

PRODUCTION OF CRUSHER

In lucky cement industry two lime stone crusher are Assembled both are hammer crusher Hammer mill at lucky reduces the size of I meter stone into 70 to 80 mm

The crushing capacity of hammer mill is 800 to 900 ton/hour. The weight of each hammer is 120 kg

UNIT NO. 3

LIMESTONE YARD/90m

A yard is made for the storage of crushed limestone in form of piles. A limestone pile being built by a boom stacker and pre-homogenization of pile is made with the help of declaimer. Crushed limestone is transported by a 90 m long belt to the storage yard then it drop the material on chand belt then chand belt drop on boom belt then with the help of boom stacker piles are made then after pre-homogenization the lime stone is transported to the proportionating building by buckets then on long belt.

UNIT NO. 4

RAW MILL PROPORTIONATING

INTRODUCTION

In lucky cement there is a Proportionating tower. It is a building which store raw material Silos of individual raw materials are arranged. It has hoppers which provide feed to weigh-feeder. Accurately controlled proportions of each material are delivered onto the belt by weigh-feeders. The proportion of raw material is decided by Laboratory usually luck cement industry works on following titration.

- Limestone 75 to 85 %
- Purchase clay 6 to 7 %
- Lucky clay 5 to 6 %
- Laterite clay 1 to 2 %

WEIGH FEEDER

Weigh feeder is a machine which weigh's the material according to the defined composition and supply to the conveyer belt which take the material to the work place.

Decision of proportion of raw material for grinding.

In practice, the raw material for raw mix is controlled by frequent chemical analysis (hourly by X-Ray fluorescence analysis in the laboratory, or every three minutes by prompt gamma neutron activation analysis). The analysis data is used to make automatic adjustments to raw material feed rates.

UNIT NO. 5

VERTICAL RAW MILL GRINDING, BAG HOUSE & SILO

GRINDING OF RAW MATERIAL

After deciding the ratio of raw material at proportioning tower the next step is grinding of raw material. In Lucky cement Industry Vertical Raw Mill is used for grinding the raw material.

VERTICAL RAW MILL USED FOR GRINDHING THE RAW MAERIAL

The raw materials are next ground together in a raw mill. VRM used here is consisting of 4 continuously moving Rollers. The fineness of raw mix is specified in terms of the size of the largest particles, and is usually controlled so that there are less than 5%-15% by mass of particles exceeding 90 μm in diameter. It is important that the raw mix contains no large particles in order to complete the chemical reactions in the kiln. For the grinding one (mv) motor is used it is known as Raw mill main motor it has power of 2240 kilowatt.

TRANSPORTATION OF INGREDIENTS

The Silos of individual raw materials are arranged (proportionating tower) over the feed conveyor belt. Accurately controlled proportions of each material are delivered onto the belt by weigh-feeders. Passing into the raw mill, the mixture is ground to raw mix.

ROTARY VALVE

Rotary valve is a valve which control the flow of feed at raw mill and helps in maintaining the pressure in the mill.

I.D FAN

I.D fan or induce Draft fan is the fan which provides hot air to the VRM from the preheater. It also produces negative pressure in the kiln and preheater. For the I.D fan one (mv) motor is used it is known as I.D fan motor of power 1800 kilowatt.

SYSTEM FAN

System fan is also an I.D fan but it is used for the suction of air from the VRM through the cyclones. It sucks the hot air from the VRM and send it to Bag house. It also works for maintaining the negative pressure into the VRM. In the system fan one (mv) motor is used it is known as system fan motor of power 2000 kilowatt.

TRAVELING OG HOT AIR

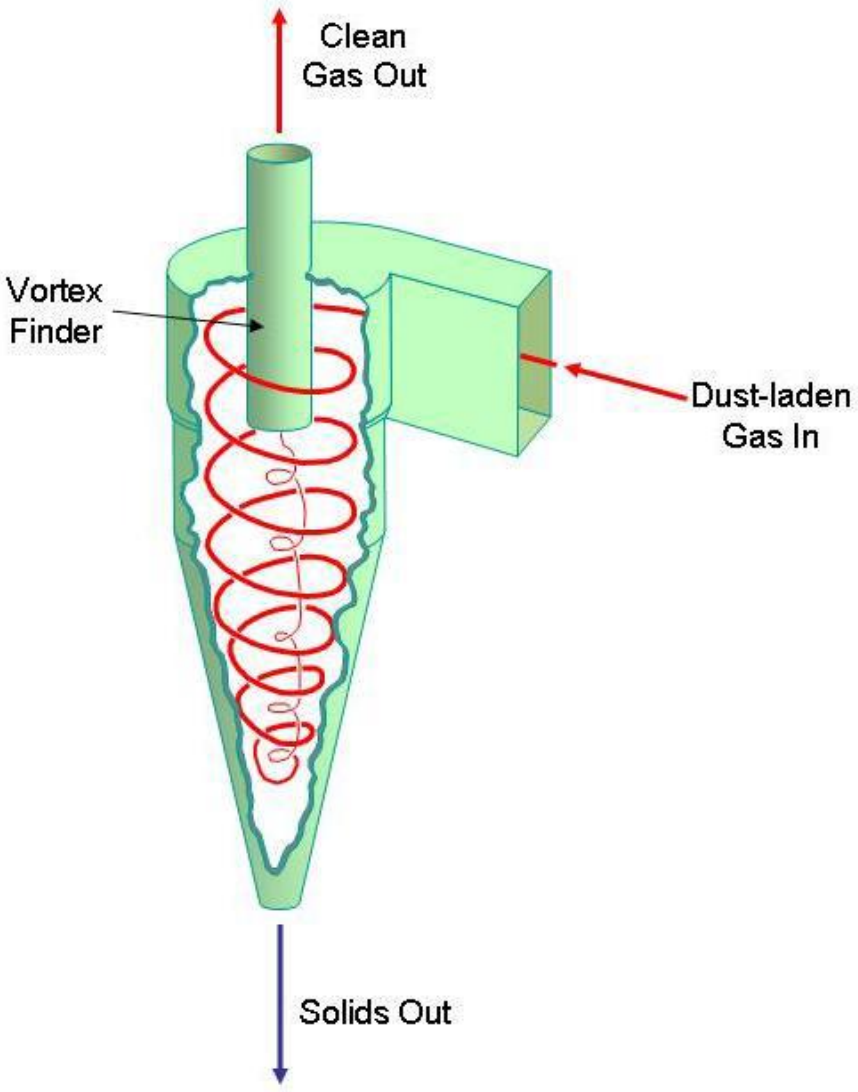
In the plant area or VRM area the hot Air flows from one place to another through the Ducts.

Ducts are pipe lines of very diameter which are used for transportation purpose.

CYCLONE

A cyclone is a conical vessel into which a dust-bearing gas-stream is passed tangentially. This produces a vortex within the vessel. The gas leaves the vessel through a co-axial "vortex-finder". The solids are thrown to the outside edge of the vessel by centrifugal action, and leave through a valve in the vertex of the cone. Cyclones were originally to used

clean up the dust-laden gases leaving simple dry process kilns.



In lucky cement plant 4 cyclones are used in the VRM area which purify the hot gas which is coming from VRM.

AIR SLIDES

Air Slides is a mean of transportation in the cement plant it take the material from one place to another with the help of air. Bags and blowers are used in air slides. Air slides are normally used at the bottom of cyclones.

BAG HOUSE

Bag house is a collective name of many bag filters. Bag house has 20 chambers and each chamber contains 104 bags. It is also known as Dust Collector or Fabric filters. In lucky the most common type of bag filters are used which operates with a velocity of about 0.01 m/s across the bag surface.

BAG HOUSE FAN

Bag house fan is a suction fan which helps the bag house in filtering the hot air from cyclones. If it does not work properly then there is a need to shut down the plant because it also helps in producing the negative pressure and prevention of atmosphere from pollution.

OUTLET OF EXTRA GASES

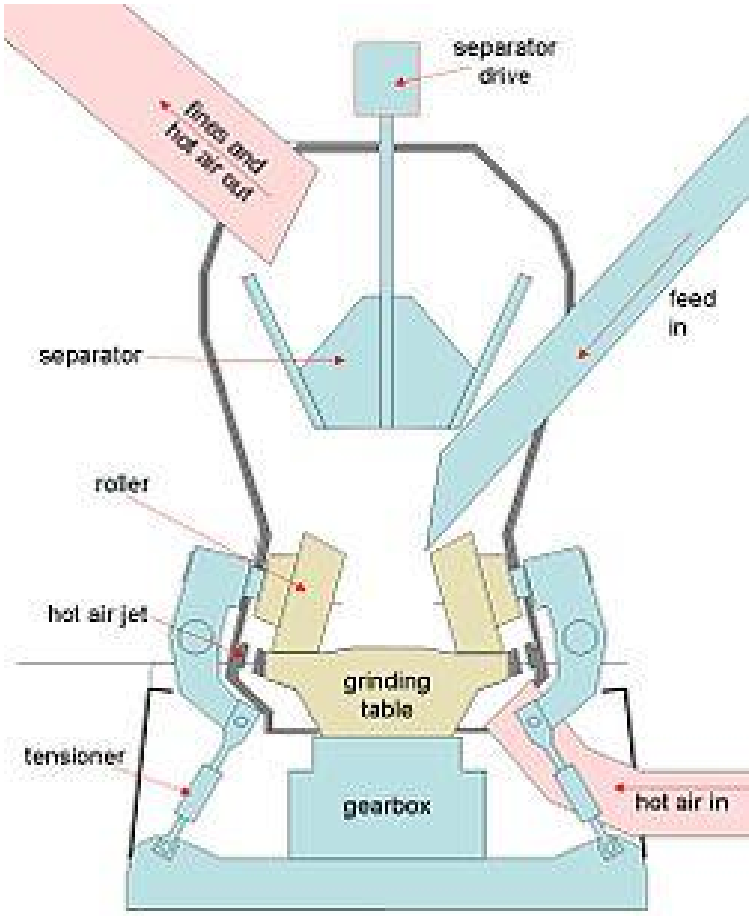
The bag house remove fine raw mix particles from the hot air then remaining extra gases containing SOx, NOx, CO and CO2 released in the atmosphere.

STORAGE OF POWDER GRINDED RAW MATERIAL TO THE SILO

Raw material in required ratio is grinded by the Vertical Raw mill is separated by the cyclones is sent to the 65m silo having capacity 3300 tons with the help of air slides, screw conveyers and bucket elevators . This silo is also used to give feed to the pre-heater

HOMOGENIZATION OF GRINDED RAW MATERIAL

As the raw mix is stored in the silo that's why its need to homogenize it for this purpose heavy compressor are used which through air from the downward due to which a continuous motion occurs in the material and Homogenization of grinded raw material takes place.


separator
drive
fines and
hot air out
feed
in
separator
roller
hot air jet
grinding
table
tensioner
gearbox
hot air in

UNIT NO. 6

CALCINATION & HEAT EXCHANGE

Raw material enters the pre heater for pre heating before sending to the rotatory kiln it is also known as four stage tower it is about 87m high ,consisting of cyclones , riser duct (gas duct) and pre calciner,(pc).

To conserve energy most modern cement plants pre heat raw material before they enter the kiln using the exhaust gases from kiln itself.

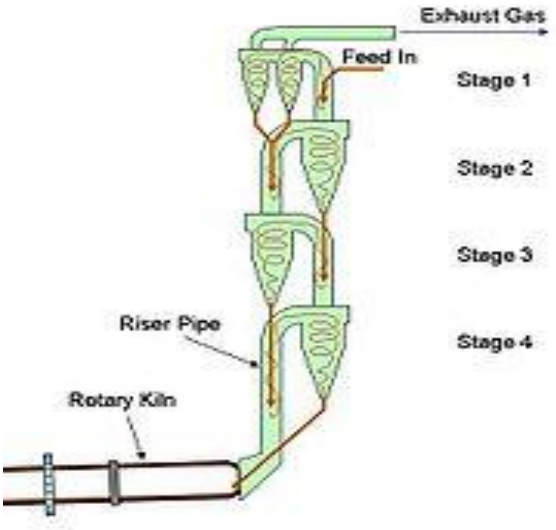
In Lucky cement plant a 5 stage pre-heater is used. Pre-heater is divided into two section

• Cyclones of pre-heater. Where heat exchange takes place between the feed (raw mix) and hot air.

• Pre-calciner (P.C) where calcinations takes place. In pre calciner abut 75-80% calcination (formation of cao) take place by decomposition of $CaCO_3$ into CaO & CO_2. $CaCO_3$_____$CaO+CO_2$ (calcination)

To understand a pre-heater completely I have given a 4 stage pre-heater description with diagram.

Gas-suspension preheaters Cutaway view of cyclone showing air path the key component of the gas-suspension pre-heater is the cyclone and the pre-calciner. A cyclone is a conical vessel into which a dust-bearing gas-stream is passed tangentially. This produces a



vortex within the vessel. The gas leaves the vessel through a co-axial “vortex-finder". The solids are thrown to the outside edge of the vessel by centrifugal action, and leave through a

valve in the vertex of the cone. Cyclones were originally used to clean up the dust-laden gases leaving simple dry process kilns. If, instead, the entire feed of raw mix is encouraged to pass through the cyclone, it is found that a very efficient heat exchange takes place: the gas is efficiently cooled, hence producing less waste of heat to the atmosphere, and the raw mix is efficiently heated. This efficiency is further increased if a number of cyclones are connected in series.

4-Stage preheater, showing path of feed.

The number of cyclones stages used in practice varies from 1 to 6. Energy, in the form of fan-power, is required to draw the gases through the string of cyclones, and at a string of 6 cyclones, the cost of the added fan-power needed for an extra cyclone exceeds the efficiency advantage gained. It is normal to use the warm exhaust gas to dry the raw materials in the raw mill, and if the raw materials are wet, hot gas from a less efficient preheater is desirable. For this reason, the most commonly encountered suspension preheaters have 4 cyclones. The hot feed that leaves the base of the preheater string is typically 20% calcined, so the kiln has less subsequent processing to do, and can therefore achieve a higher specific output. Typical large systems installed in the early 1970s had cyclones 6 m in diameter, a rotary kiln of 5 x 75 m, making 2500 tones per day, using about 0.11-0.12 tons of coal fuel for every tones of clinker produced.

A penalty paid for the efficiency of suspension preheaters is their tendency to block up. Salts, such as the sulfate and chloride of sodium and potassium, tend to evaporate in the burning zone of the kiln. They are carried back in vapor form, and re-condense when a sufficiently low temperature is encountered. Because these salts re-circulate back into the raw mix and re-enter the burning zone, a recirculation cycle establishes itself. A kiln with 0.1% chloride in the raw mix and clinker may have 5% chloride in the mid-kiln material. Condensation usually occurs in the preheater, and a sticky deposit of liquid salts glues dusty raw mix into a hard deposit, typically on surfaces against which the gas-flow is impacting. This can choke the preheater to the point that air-flow can no longer be maintained in the kiln. It then becomes necessary to manually break the build-up away. Modern installations often have automatic devices installed at vulnerable points to knock out build-up regularly. An alternative approach is to "bleed off" some of the kiln exhaust at the kiln inlet where the salts are still in the vapor phase, and remove and discard the solids in this. This is usually termed an "alkali bleed" and it breaks the recirculation cycle. It can also be of advantage for cement quality reasons, since it reduces the alkali content of the clinker. However, hot gas is run to waste so the process is inefficient and increases kiln fuel consumption. Cement plant pre heater Designed by Polybius, this new plant includes a four-stage pre-calciner with a 158-foot (48-meter) long by 13-foot (4- meter) diameter two-station kiln to produce 2,500 tons per day of clinker.

TARGET OF PRE-HEATER

Pre-heater is used for heat exchange and calcinations. In lucky cement plant Pre-heater's and out let temperature is 350 to 400 C. The raw material is burned in the pre-heater for 52 seconds and then it is sent to kiln.

It increases the production capacity, it reduces the specific heat consumption also reduces specific power consumption.

ADVANTAGE OF PRE-HEATER

INLET OF FEED TO PRE-HEATER

Feed is entered through the feed silo in the riser of cyclone 2 with help of bucket elevators.

CONSTRUCTION OF FEED SILO

The capacity of this silo is mentioned above here I want to tell u that below the silo there is a bin where feed to pre-heater is homogenized and weighed the capacity of this bin is 100 ton. This bin is connected to 8 gates of air slides which opens in the opposite pair of two and provide feed to the main air slide on the rate of 215 tons/h.

BIN STORAGE AND SILOS

Bins are cylindrical or rectangular vessels of concrete or metals .a silo is tall and relatively small in diameter .a bin is not so tall and usually fairly wide .silos and bins are loaded from top by some kind of elevator. Discharging is done from the bottom.

PRESSURE IN BINS AND SILOS

When solid or semi solids are placed in a bin or silo the lateral pressure exerted on the wall at any point is less than predicted from the head of material above that point .there usually is friction between walls and solids. The friction Force at the wall tends to offset the weight of solid and reduces the pressure exerted by mass on the floor of container .in general when height of solids column is greater than about 3 times diameter of the container, additional solids have no effect on the pressure at the base.

FLOW OUT OF BINS

solids tend to flow out of any openings near the bottom of bin but are best discharged through an opening in the floor .flow through a side openings tends to be uncertain an increase the lateral pressure on the other side of bin while the solids are flowing. When out let at bottom of a bin containing free flowing is opened, the material immediately above the opening begins to flow. One of two flow pattern

will develop, depending on steepness of the walls in the bottom section of the bin and on the coefficient of friction between the solids and the bin walls. Tunnel flow develops in the bins with a shallow cone angle or with vertical walls and central opening in the floor. Here a vertical column of solids above the openings moves downward without disturbing the material at the sides. Eventually lateral flow begins, first from the top most layer of solids.

The rate of flow of solids by gravity through a circular opening in the bottom of a bin depends on the diameter of the openings and on the properties of the solid With cohesive solids it is often hard to start flow .once flow does start, however, it again begin in the material directly above the discharge opening. sticky solids and even some dry powder adhere strongly to vertical surfaces and have enough shear strength to support a plug of considerable diameter above an open discharge .thus to get flow started and to keep the material moving, vibrators on the in walls, internal plows near the bin floor, or jets of air in the discharge opening are often needed.

PRE-CALCINER BURNER

Pre calciner burner is composed of two chambers vortex chamber and reaction chamber, the vortex chamber is situated at the end of tertiary air duct, close to the entry to the kiln gases, they can therefore get preliminarily mixed. the tertiary air is drawn from the middle part of the burner and is therefore of medium temperature about 750 to 850 C. in these conditions a condensations of volatile components of the feed occurs on the grains of raw material and they are recycled to the kiln, which allows the formations of accretions on the walls of pre-calciner to be avoided. The raw mix is fed to side upper part of reaction chamber, while in lower part 2 burners are arranged readily round the shaft of the chamber.

Due to vortex motion of the gases in the gases in the axis of reaction chamber negative pressure is developed, facilitating the introduction of the grains of the fuel and meal to the fuel and meal to the inside chamber.

PRE- CALCINATIONS

A first principle model of cement pre-calcination system is developed for the purpose of controller's design and synthesis. The dynamic model is based on the mass and energy balance principle and consists of a set of ordinary differential equations. Based on some logical assumptions, the model not only considers the reaction mechanisms but also reduces the complexity of pre-calciner system. The model is divided into a preheater sub model and a calciner sub model. Separate sub model for preheater and calciner are initially developed and coupled together to build an integrated model. The model takes the gas content into account and can obtain the values of all key output variables in pre-calcination process.

OVERALL PRE-HEATER PROCESS

In lucky cement plant feed is entered in the razor of cyclone 2 than hot air take the feed to Cyclone 1A and 1B, outlet of cyclone 1A and 1B drop the material in razor R-3 than hot air take the material to C-2 , out let of C-2 drop the feed into R-4 than hot air takes the material to C-3 , outlet of C-3 drop the material into R-5 than hot air takes the feed into C-4 , the outlet of C-4 drops the material in P.C. where calcinations of raw mix take place. Here two burners are used for this purpose fresh air is also given to the burners. Burners use pulverize coal for burning. The temperature of P.C is 850 to 900 C and has an pressure of -813 Pascal,

After the calcinations hot air takes the material in C-5 through the goose neck of P.C., This reaction takes place in the calcination zone

$CaCO_3 \rightarrow CaO + CO_2$ (lime stone) (lime)

The outlet of C-5 drops the material into KILN INLET OR SMOKE CHAMBER OR INLET CHAMBER.

S:NO	STAGES	TEMP	PRESSURE
1	Klin	900-950	2.6-3.6
2	Riser duct		10- 11
3	P.C	900-930	8- 10
4	Cyclone -4	810-850	18-12
5	Cyclone-3	750-770	30-35
6	Cyclone -2	550-600	40-55
7	Cyclone -1	350-380	55-65

8	I.D fan	350- 370	65-70
9	Secondary	1100-1150	--- ---
10	Tertiary	630-670	

PRIMARY DUCT

A method and apparatus for controlling the combustion of fuel modules charged into a preheater or pre-calciner kiln above the transition shelf, typically into the riser duct, is described. The apparatus includes a sensor for providing signals indicative of the status in the region of combustion of the fuel modules, and a controller for a fuel module feed mechanism is provided to receive signals indicative of the status of the combustion region and adjust the rate of delivery of the fuel module into the combustion region responsive to the sensed conditions in the combustion region.

UNIT NO. 7

KLIN AREA

INTRIDUCTION TO KILN

Cement kilns are used for the pyro processing stage of manufacture of Portland and other types of hydraulic cement, in which calcium carbonate reacts with silica-bearing minerals to form a mixture of calcium silicates. Over a billion tons of cement are made per year, and cement kilns are the heart of this production process: their capacity usually define the capacity of the cement plant. As the main energy-consuming and greenhouse-gas–emitting stage of cement manufacture, improvement of their efficiency has been the central concern of cement manufacturing technology.

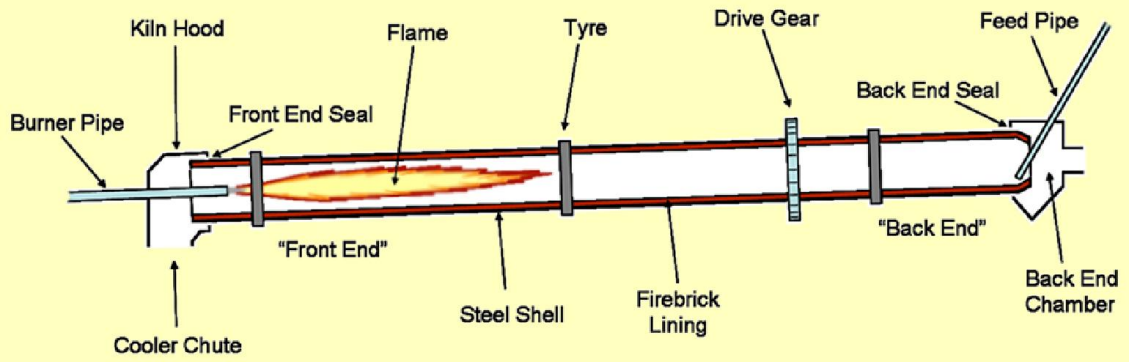
Kiln is consist of 4 zones;

- Calcinations zone
- Transition zone
- Burning zone
- Cooling zone

Kiln used at Lucky cement plant is

- 64 meter in length,
- Total diameter of kiln is 4.3 meter and effective diameter is 3.9 meter.
- Slop of kiln is 3.5 %.
- Migration of kiln is 4-5 rpm.

THE ROTARY KILN



General layout of a rotary kiln

The rotary kiln consists of a tube made from steel plate, and lined with firebrick. The tube slopes slightly (1 between 30 and 250 revolutions per hour. Raw mix is fed in at the upper end, and the rotation of the kiln causes it gradually to move downhill to the other end of the kiln. At the other end fuel, in the form of gas, pulverized solid fuel, is blown in through the "burner pipe", producing a large concentric flame in the lower part of the kiln tube. As material moves under the flame, it reaches its peak temperature, before kiln tube into the cooler. Air is drawn first through the cooler and then through the kiln for combustion of the fuel. In the cooler the air is heated by the cooling clinker, so that it may be 400 to 800 °C before it enters the kiln, thus causing intense and rapid combustion of the fuel.

Kiln are typically stopped only for a few days once or twice a year for essential maintenance.

IGNITION OF KILN

Sometime once or twice in a year kiln is shutdown maintenance purpose. After the completion of maintenance the kiln is again ignited.

For the ignition of kiln first of all furnace oil is used because it has higher calorific value 9760 cal Furnace oil used for kiln main burner is first treated in a boiler to decrease its viscosity at minimum level due to which it flows very well. When the required initial temperature of kiln is maintained than kiln is burned on pulverize coal whose calorific value is 5800 cal.

As we know that oxygen is necessary for ignition that's why blowers are used which provides fresh air to the main burner.

KILN PROCESS IN LUCKY CEMENT PLANT

A fter pre heating and pre calcinated material enters in burning and clinker zone of kilns where temp ranges from 1000C-1350C.

Here CaO reacts with other oxides to form cementeous material. Burning of kiln involves the following steps;

1. Evaporation of free water at temperature up to 100 C

2. Removal of absorbed water in clay material 100-300 C

3. Removal of chemically bounded water 450-900 C

4. Calcinations of carbonate materials 700-850 C

5. Formation of C2S, Aluminates and ferrite's 800-1250 C

6. Formation of liquid phase melt > 1250 C

7. Formation of C3S 1330-1450 C

8. Cooling of clinker to solidify liquid phase 1300-1240 C

9. Final clinker microstructure frozen in clinker < 1200 C

10. Clinker cooled in cooler 1250-100 C

The final product as it comes out the kiln is known as clinker.

REACTION AT KILN

Following major reactions take place inside the kiln.)

$2CaO + SiO_2 \rightarrow 2CaO.SiO_2$

(Dicalcium silicate)

$3CaO + SiO_2 \rightarrow 3CaO.SiO_2$

(Tri Calcium Silicate)

$3CaO + Al_2O_3 \rightarrow 3CaO.Al_2O_3$

(TRI CALCIUM ALUMINATE) .

$4CaO+AlO_3+Fe_2O_3 \rightarrow 4CaO.Al_2O_3.Fe_2O_3$

(Tetra Calcium Aluminum Ferrate)

FORMATION OF CLINKER

At about 1280 0C And above clinker is formed which is in the form of compound that is known as cement compound. The composition of clinker is as followed. COMPOSITION OF CLINKER

C3S	55-56%
C2S	21-22%
C3A	5-6(FOR OPC)
C3A	<3.5(FOR SRC)
C4AF	1213(FOR OPC)
C4AF	1617(FOR SRC)

OUTLET OF CLINKER

UNIT NO. 8

COOLING AND STORAGE OF CLINKER

In lucky cement a grate cooler is used to cool the clinker. These coolers have two main advantages: they cool the clinker rapidly, which is desirable from a quality point of view, and, because they don't rotate (rotating coolers used in early ages) , hot air can be ducted out of them for use in fuel drying, or for use as pre-calciner combustion air.

FAN FOR COOLER.

8 Fans are also used to force air through the cooler bed or grates.

CONSTRUCTION OF COOLER

This consists of a perforated grate through which cold air is blown, enclosed in a rectangular chamber. A bed of clinker up to 0.5 m deep moves along the grate. The grates are moved with the help of a hydraulic system.

COOLER CRUSHER

Rotary crushers are used at the out let of a cooler. These crushers crush the big pieces of cooled clinker into small ones.

PAN CONVERYER

Pan conveyer is the medium used for transportation of material in heavy amount. It consist of a chain of pan joined with each other in the form of a belt. Motors are used to run them.

STORAGE OF CLINKER

Cooled clinker from the cooler is transported to the clinker storage yard with the help of pan conveyer.

UNIT NO. 9

GRIDING OF COAL

COAL MILL

In Lucky Coal mill is the place where coal is grinded into fine powder for this purpose a small Roller mill or VRM (Vertical Raw Mill) is used.

COAL GRINDING

Grinding of coal Also take place in a small roller mill or VRM (Vertical Raw Mill) but it has only two Stationary Rollers other working is same as define above for the VRM. Coal mill design capacity is 25 tons/h and its inlet temperature is 92 C.

PULVERIZE COAL

Fine powdered coal is called Pulverize coal. The coal is grind to fine powder because the fine coal is very easy to burn in the kiln or PC (pre- calciner)

COAL STORAGE BIN

After Grinding the coal is stored in a bin whose capacity is 100 ton but in lucky cement only 25 to 30 % bin is filled because coal can catch fire from the surrounding.

FIRE EXTINGUISHER SYSTEM

A latest fire extinguisher system is installed in the Coal mill area which is fully automatic and can also be control through the PLC (Programmable Logic Controller).

COAL TRANSPORTATION

1. Pre-calciner (PC)

2. Main burner (kiln)

The Grinded coal is used as a fuel in PC and kiln so it is transported to them through the Delta Blowers.

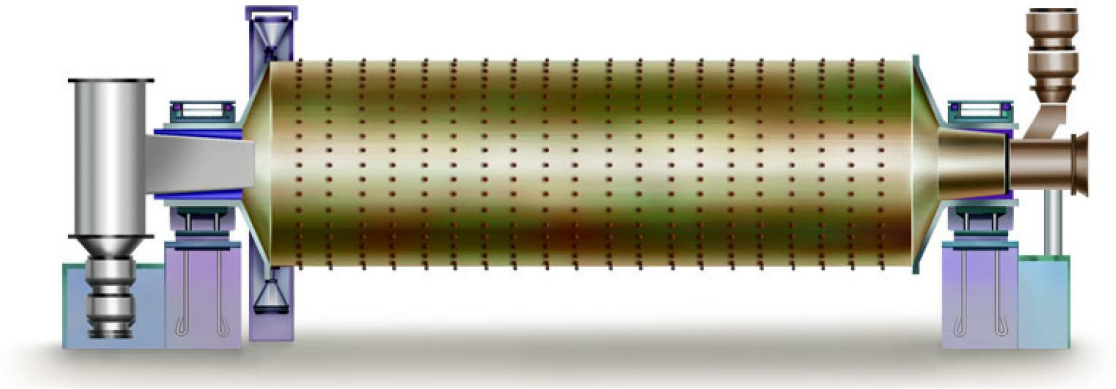
In Lucky 4 Delta Blowers are used, 2 are used for transportation of coal to the PC and 2 are used for the transportation of coal to the main Burner at kiln.

UNIT NO. 10

CEMENT MILL

Cement mill is the area where finally cement is manufacture by the addition of second stage raw materials (Slag , Gypsum and clinker) it consist of following parts

Diagram of CEMENT MILL



Roller press or crusher Crushing Separator Storage bin Ball mill in lucky cement plant the cement mill is used is actually a ball mill.

The length of ball mill is 13 meter. It is divided into two chambers. Its 1st chamber is 3 meter long and 2nd chamber is 10 meter long. The efficiency of ball mill depends on the size and weight of media or grinding medium. Media size in 1st chamber is 30, 40, 50 and 60 mm and in 2nd chamber is 10 x12, 12x14 mm. Weight of media in ball mill is 180 ton.

GRINDING AID GLYCOL

Grinding aid Glycol is used as grinding aid in ball mill. Due to high temperature gypsum under goes hydration so lumps form in the mill which chock the out let of ball mill so glycol stops this phenomena.

UNIT NO. 11

PACKING PLANT LOOSE CEMENT

Lucky cement also export loose cement by loading it into through bunker. Daily it export ton per day.

LOOSE CEMENT STORAGE

Loose cement storage and ship loading terminal at berth -25 west wharf Karachi port

PACKED CEMENT